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NGUYEN, PHUONGCHAU BA	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/749,903	SADRI ET AL.	
	Examiner	Art Unit	
	PHUONGCHAU BA NGUYEN	2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *3-14-8*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *7,8,30* is/are allowed.

6)☒ Claim(s) *1,3-6,9-19,22,25,28 and 31-33* is/are rejected.

7)☐ Claim(s) *2,20,21,23,24,26,27 and 29* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 3, 5, 22, 25, 28 are rejected under 35 U.S.C. 102(e) as being anticipated by Crawford (US 2006/0160737 A1)

Regarding claim 1,

Crawford discloses a receiver comprising:

antenna selection circuitry (108-fig.1) to select more than one of a plurality of spatially diverse antennas (102-fig.2) to receive an orthogonal

frequency division multiplexed symbol over a wideband channel comprising a plurality of subchannels, see 0036-0037; and

combining circuitry (108-fig.1) to combine corresponding frequency domain symbol-modulated subcarriers from the selected antennas to generate combined symbol-modulated subcarriers for each subchannel of the wideband channel, see 0036-0037.

Regarding claim 3, Crawford further discloses wherein the combining circuitry (108-fig.1) comprises maximum-ratio combining circuitry (MRC-0036) to combine the corresponding frequency domain symbol-modulated subcarriers of the subchannels, and wherein the combining circuitry comprises maximum-ratio combining circuitry to weight at least some of the frequency domain symbol-modulated subcarriers prior to combining the corresponding frequency domain symbol-modulated subcarriers substantially proportional to signal strength, see 0036.

Regarding claim 5, Crawford further discloses wherein the antenna selection circuitry (108-fig.1) is to select a first antenna (i.e. a5) of the plurality of antennas to receive the subchannels of the wideband channel, wherein the antenna selection circuitry is to select a second antenna(i.e., a6) of the plurality of antennas to further receive the subchannels of the wideband channel, and wherein the antenna selection circuitry (106-fig.1) is to select the first and the second antennas from the plurality based on an average signal-to-noise (SNR, 0036) of signals in the subchannels, see also 0037-0038.

Regarding claim 22,

Crawford discloses a receiver comprising: radio-frequency circuitry (102-fig.1) to receive an orthogonal frequency division multiplexed symbol over a subchannel through a plurality of spatially diverse antennas; and maximum-ratio combining circuitry (MRC, 0036) to combine corresponding frequency

domain symbol-modulated subcarriers from each of the antennas to generate combined symbol-modulated subcarriers for the subchannel.

Regarding claim 25,

Crawford discloses a system comprising:

a plurality of substantially omnidirectional spatially diverse antennas (102-fig.1);

antenna selection circuitry (selector 108-fig.1) to select more than one of the antennas to receive an orthogonal frequency division multiplexed symbol over a wideband channel comprising a plurality of frequency-separated subchannels, see 0036; and

maximum-ratio combining circuitry (combiner 108-fig.1) to combine corresponding frequency domain symbol-modulated subcarriers from the

selected antennas to generate combined symbol-modulated subcarriers for each subchannel of the wideband channel, see 0036-0037.

Regarding claim 28,

Crawford discloses a reconfigurable receiver (fig.1) comprising: antenna selection circuitry (selector 108-fig.1) to select one or more of a plurality of spatially diverse antennas (102-fig.1) to receive one or more of a plurality of subchannels; and maximum-ratio combining circuitry (combiner 108-fig.1) to combine, when more than one antenna per subchannel is selected, corresponding symbol-modulated subcarrier of subchannels from different selected antennas, see 0036-0037.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Crawford as applied to claim 1, and further in view of Polley (US 2005/0113041A1).

Regarding claim 4, Crawford does not disclose wherein parallel groups of time domain samples are to be generated from each of the subchannels received by each of the antennas, and wherein the receiver further comprises fast Fourier transform circuitry to perform fast Fourier transforms on the parallel groups of time domain samples.

However, in the same field of endeavor, Polley (US 2005/0113041A1) discloses wherein parallel groups of time domain samples (via TimeDomain 534, 536-fig.5) are to be generated from each of the subchannels received by each of the antennas (524, 526-fig.5), and wherein the receiver further comprises fast Fourier transform circuitry (508, 510-fig.5) to perform fast

Fourier transforms on the parallel groups of time domain samples. Therefore, it would have been obvious to an artisan to apply Polley's teaching to Crawford's system with the motivation being to transform time-domain signals into frequency domain signals to diversity receiver.

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Crawford as applied to claim 5 above, and further in view of Kuroda (6,603,961).

Regarding claim 6, Crawford does not disclose (1) low-noise amplifiers (AGC 13-fig.1) to amplify radio-frequency signals of at least both subchannels; (2) downconversion circuitry to downconvert radio-frequency signals for each subchannel received through each antenna; and (3) analog-to-digital conversion circuitry to generate digital signals for each subchannel received through each antenna.

However, in the same field of endeavor, Kuroda (6,603,961) discloses the receiving portions 102-fig.3 for performing AGC, corresponding to (1); converting the received signal into intermediate frequency signals, corresponding to (2); and ADC (not shown), however inherent therein the receiving portion, because without ADC, no digital signals input to FFT circuits 105-fig.3, corresponding (3); see also col.3, lines 19-46. Therefore, it would have been obvious to an artisan to apply Kuroda's teaching to Crawford's system, with the motivation being to receive and process OFDM signals received from antennas. This is a common practice in the art.

6. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Crawford as applied to claim 1 above, and further in view of Liang (US 2003/0165131A1).

Regarding claim 9, Crawford does not disclose (1) equalizer circuitry to perform separately for the more than one subchannel, a channel equalization on the

combined symbol-modulated subcarriers of an associated subchannel provided by the combining circuitry).

However, in the same field of endeavor, Liang (US 2003/0165131A1) discloses equalizer (412-figs, 7-8), corresponding to (1). Therefore, it would have been obvious to an artisan to apply Liang's teaching to Crawford's system with the motivation being to improve channel capacity utilization under multipath interference and frequency selective fading reception caused by multipath delay suppression.

7. Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Crawford in view of Liang as applied to claim 9 above, and further in view of Walton (US 2003/0043732 A1).

Regarding claim 10,

Crawford discloses all the claimed limitations, except (1) subcarrier demappers to demap, after the channel equalization, the combined symbol-

modulated subcarriers of each subchannel to generate parallel groups of bits from the subcarriers; and (2) additional processing circuitry to generate a single decoded bit stream representing the orthogonal frequency division multiplexed symbol from the parallel groups of bits of the more than one subchannel. However, in the same field of endeavor, Walton (US 2003/0043732 A1) discloses subcarrier demappers (Demode & De-Interleaver 730a-fig.7) to demap, after the channel equalization, the combined symbol-modulated subcarriers of each subchannel to generate parallel groups of bits from the subcarriers; and additional processing circuitry (Decoder 730a-fig.7) to generate a single decoded bit stream representing the orthogonal frequency division multiplexed symbol from the parallel groups of bits of the more than one subchannel (0200 & see also fig.6a), corresponding to (1-2). Therefore, it would have been obvious to an artisan to apply Walton's teaching to Crawford's system with the motivation being to improve performance using only good channels in each group and matching the data processing for the selected channels to the capacity achievable by the channels.

Regarding claim 11,

Crawford discloses all the claimed limitation, except (1) wherein the subcarrier demappers are to demap the subcarriers of each subchannel in accordance with individual subcarrier modulation assignments particular to the subchannel to generate the parallel groups of bits. However, in the same field of endeavor, Walton discloses wherein the subcarrier demappers (Demod & De-Interleaver 730a-fig.7) are to demap the subcarriers of each subchannel in accordance with individual subcarrier modulation assignments particular to the subchannel to generate the parallel groups of bits (0200), corresponding to (1). Therefore, it would have been obvious to an artisan to apply Walton's teaching to Crawford's system with the motivation being to improve performance using only good channels in each group and matching the data processing for the selected channels to the capacity achievable by the channels.

8. Claims 12-14, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Crawford in view of Walton.

Regarding claim 12, Crawford discloses a method comprising:

selecting (selector 108-fig.1) at least two antennas from a plurality of antennas to receive more than one subchannel of a wideband channel, the subchannels comprising a plurality of orthogonal frequency division multiplexed subcarriers, see 0036;

combining (combiner 108-fig.1) corresponding frequency domain symbol-modulated subcarriers of the subchannels to generate combined symbol-modulated subcarriers for each subchannel, see 0036-0037.

Crawford discloses all the claimed limitations, except (1) processing the combined symbol-modulated subcarriers to demodulate an orthogonal frequency division multiplexed symbol from the more than one subchannel. However, in the same field of endeavor, Walton discloses Demod 730a-fig.7 (0200 & see also fig.6a), corresponding to (1). Therefore, it would have been

obvious to an artisan to apply Walton's teaching to Crawford's system with the motivation being to improve performance using only good channels in each group and matching the data processing for the selected channels to the capacity achievable by the channels.

Regarding claim 13, Crawford further discloses performing fast Fourier transforms (FFT, fig.12A) on parallel groups of time domain samples for the subchannels received through each of the antennas, wherein the combining comprises maximum-ratio combining (MRC, 0036) comprising weighting at least some of the frequency domain symbol-modulated subcarriers and proportionally combining the weighted frequency domain symbol-modulated subcarriers of the more than one subchannel, and wherein the proportionally combining comprises combining the frequency domain symbol-modulated subcarriers substantially proportional to their signal strength (0036-0037).

Regarding claim 14, Crawford further discloses wherein selecting comprises: selecting (101-fig.1) a first pair of antennas of the plurality of antennas to receive one subchannel of the wideband channel (0036); selecting (101-fig.1) a second pair of antennas of the plurality of antennas to further receive the one subchannel of the wideband channel (0036-0038); and selecting (108-fig.1) the first and the second pairs of antennas from the plurality based on a signal-to-noise ratio of signals of the subchannel (0036-0038).

Regarding claim 19,

Crawford discloses a receiver comprising:

antenna selection circuitry (108-fig.1) to select one or more of a plurality of spatially diverse antennas to receive an orthogonal frequency division multiplexed symbol over a wideband channel comprising more than one of a plurality of subchannels, see 0036; and

Crawford discloses all the claimed limitations, except (1) subcarrier demodulators to demodulate frequency domain symbol-modulated subcarriers of the more than one subchannel to generate parallel groups of bits from the subcarriers; (2) wherein the processing circuitry is to generate a single decoded bit stream representing the orthogonal frequency division multiplexed symbol from the parallel groups of bits of the more than one subchannel. However, in the same field of endeavor, Walton discloses Demod & Decoder 730a-fig.7 & fig.6a and see 0200, corresponding to (1-2). Therefore, it would have been obvious to an artisan to apply Walton's teaching to Crawford's system with the motivation being to improve performance using only good channels in each group and matching the data processing for the selected channels to the capacity achievable by the channels.

9. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Crawford in view of Walton as applied to claim 12 above, and further in view of Kuroda (6,603,961).

Regarding claim 15, Crawford does not disclose: (1) amplifying, for each selected antenna, radio-frequency signals of the more than one subchannel; (2) individually downconverting the radio-frequency signals separately for each subchannel and received through each antenna; and (3) generating digital signals for each subchannel received through each antenna.

However, in the same field of endeavor, Kuroda (6,603,961) discloses the receiving portions 102-fig.3 for performing AGC, corresponding to (1); converting the received signal into intermediate frequency signals, corresponding to (2); and ADC (not shown), however inherent therein the receiving portion, because without ADC, no digital signals input to FFT circuits 105-fig.3, corresponding (3); see also col.3, lines 19-46. Therefore, it would have been obvious to an artisan to apply Kuroda's teaching to Crawford's system, with the motivation being to receive and process OFDM signals received from antennas. This is a common practice in the art.

10. Claims 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Crawford in view of Walton as applied to claim 12 above, and further in view of Liang (US 2003/0165131A1).

Regarding claim 16, Crawford does not disclose (1) performing a channel equalization separately for the more than one subchannel on the combined symbol-modulated subcarriers of an associated subchannel.

However, in the same field of endeavor, Liang (US 2003/0165131A1) discloses equalizer (412-figs, 7-8), corresponding to (1). Therefore, it would have been obvious to an artisan to apply Liang's teaching to Crawford's system with the motivation being to improve channel capacity utilization under multipath interference and frequency selective fading reception caused by multipath delay suppression.

Regarding claim17, Crawford discloses all the claimed limitations, except (1) demapping, after performing the channel equalization, the combined symbol-

modulated subcarriers of each subchannel to generate parallel groups of bits from the subcarriers; and (2) processing the parallel groups of bits of the more than one subchannel to generate a single decoded bit stream representing the orthogonal frequency division multiplexed symbol.

However, in the same field of endeavor, Walton discloses Demod & De-Interleaver 730a-fig.7 and Decoder-730a-fig.7 & see also 0200 and fig.6a, corresponding (1-2). Therefore, it would have been obvious to an artisan to apply Walton's teaching to Crawford's system with the motivation being to improve performance using only good channels in each group and matching the data processing for the selected channels to the capacity achievable by the channels.

Regarding claim 18, Crawford discloses all the claimed limitations, except (1) wherein the demapping comprises demapping the subcarriers of each

subchannel in accordance with individual subcarrier modulation assignments particular to the subchannel to generate the parallel groups of bits.

However, in the same field of endeavor, Walton discloses Demod & De-Interleaver 730a-fig.7 and see 0200 & fig.6a, corresponding to (1). Therefore, it would have been obvious to an artisan to apply Walton's teaching to Crawford's system with the motivation being to improve performance using only good channels in each group and matching the data processing for the selected channels to the capacity achievable by the channels.

11. Claims 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Crawford in view of Shao (US 2004/0258174 A1).

Regarding claim 31,

Crawford discloses selecting (selector 108-fig.1; 656-fig.12a) at least two antennas from a plurality of antennas to receive more than one subchannel of a wideband channel, the subchannels comprising a plurality of orthogonal

frequency division multiplexed subcarriers, see 0036; combining (combiner 108-fig.1; 666-fig.12a) corresponding frequency domain symbol-modulated subcarriers of the subchannels to generate combined symbol-modulated subcarriers for each subchannel, see 0036-0037; and processing (demodulator 606-fig.12a) the combined symbol-modulated subcarriers to demodulate an orthogonal frequency division multiplexed symbol from the more than one subchannel.

Crawford discloses all the claimed limitations, except (1) a machine-readable medium that provides instructions which, when executed by one or more processors, cause said processors to perform operations. However, in the same field, Shao (US 2004/0258174 A1) further discloses diversity system in multicarrier communication channel having machine readable (storage) medium 800 (0084), corresponding to (1). Therefore, it would have been obvious to an artisan to implement Crawford's teaching into computer/machine processing product with the motivation being to ease the upgrade processing and cost saving.

Regarding claim 32, Crawford further discloses wherein the instructions, when further executed by one or more of said processors, cause said processors to perform operations further comprising: performing fast Fourier transforms (FFT 104-fig.12a) on parallel groups of time domain samples for the subchannels received through each of the antennas, wherein the combining (combiner 108-fig.1; 666-fig.12a); comprises maximum-ratio combining (MRC-0036) comprising weighting at least some of the frequency domain symbol-modulated subcarriers and proportionally combining the weighted frequency domain symbol-modulated subcarriers of the more than one subchannel, see 0036-0037, and wherein the proportionally combining comprises combining the frequency domain symbol-modulated subcarriers substantially proportional to their signal strength, see 0036-0037.

Regarding claim 33, Crawford further discloses wherein the instructions, when further executed by one or more of said processors, cause said processors to perform operations further comprising: selecting (selector 101, 108-fig.1) a first pair of antennas of the plurality of antennas to receive the more than one subchannel of the wideband channel; selecting (selector 101, 108-fig.1) a second pair of antennas of the plurality of antennas to further receive the more than one subchannel of the wideband channel; and selecting (108-fig.1) the first and the second pairs of antennas from the plurality based on a signal-to-noise ratio of signals in the subchannels (0036-0037).

Allowable Subject Matter

12. Claims 7-8, 30 are allowable over the prior art.

13. Claims 2, 7-8, 20-21, 23-24, 26-27, 29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in

independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

14. Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to PHUONGCHAU BA NGUYEN whose telephone number is (571)272-3148. The examiner can normally be reached on Monday-Friday from 8:30 a.m. to 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Firmin Backer can be reached on 571-272-6703. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/PHUONGCHAU BA NGUYEN/
Examiner, Art Unit 2616